

# Survey on Climate-Based Daylight Modelling workflows

Eleonora Brembilla



4-component method  
DAYSIM

rtcontrib / rcontrib

3-phase method

4-phase method

5-phase method

6-phase method

...

n-phase method?

DIVA-for-Rhino

OpenStudio

IESve

SPOT

DALEC

Groundhog

LightStanza

Honeybee

LiVi for Blender

IDA ICE

TypeDLT for TRNSYS

...

more to come!

3DStudioMax

EDSL TAS

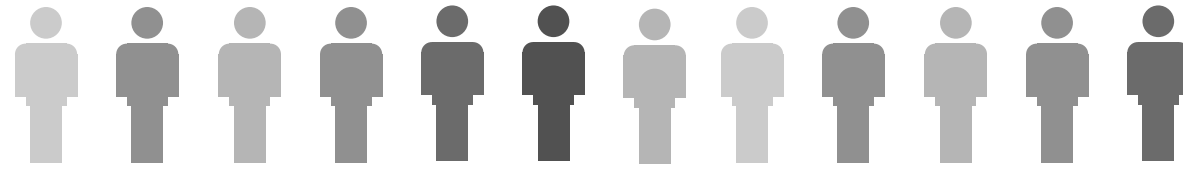
EvaIDRC

...

what next?

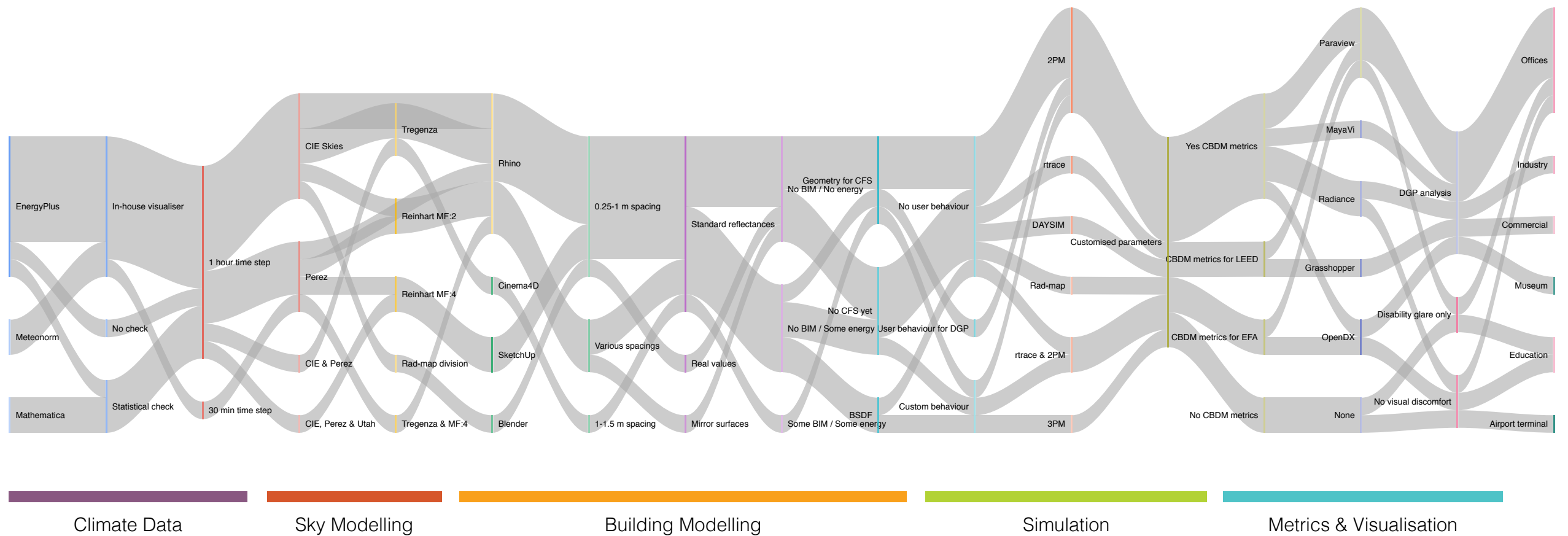
Is there a **common framework** to perform CBDM?

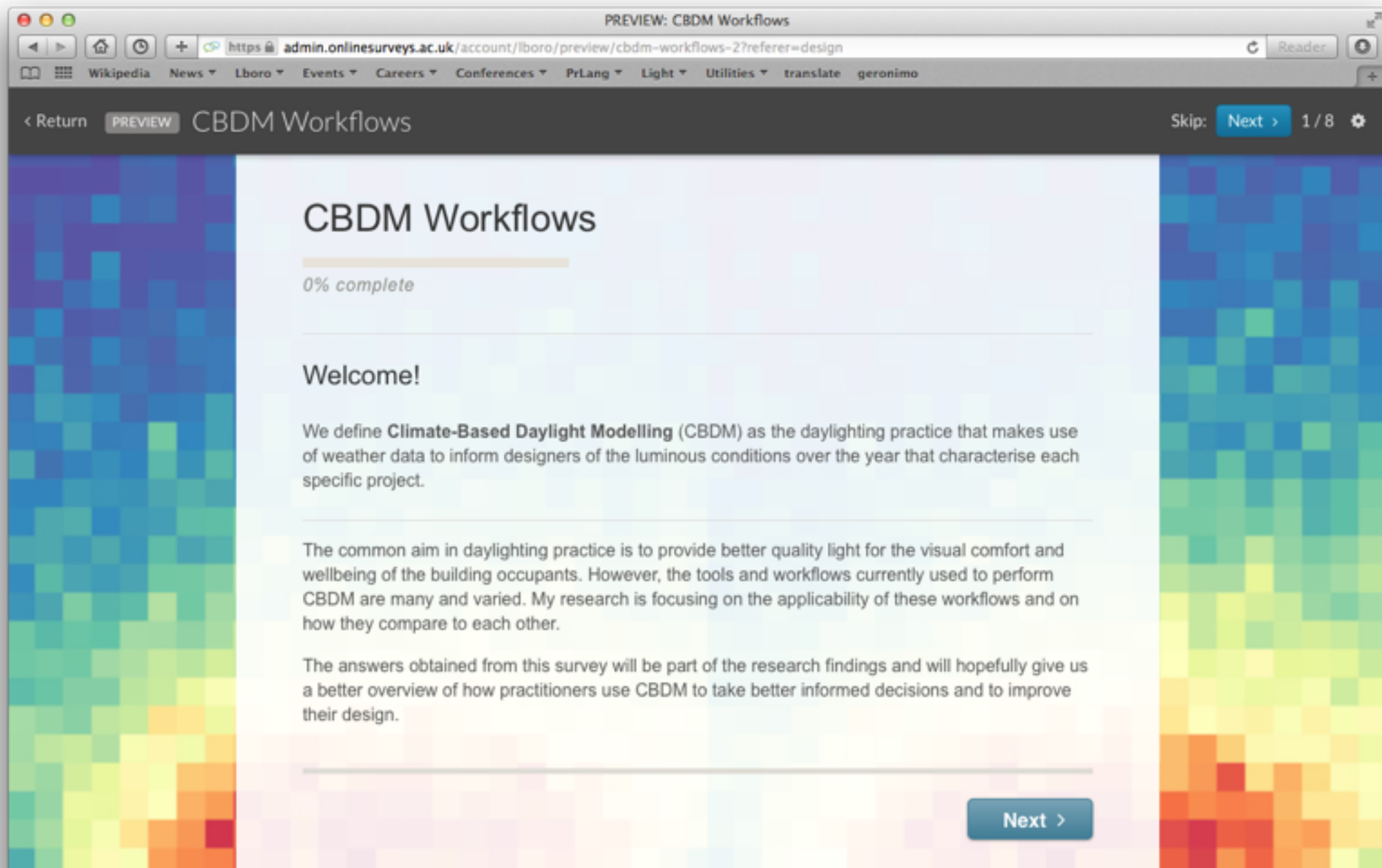
No



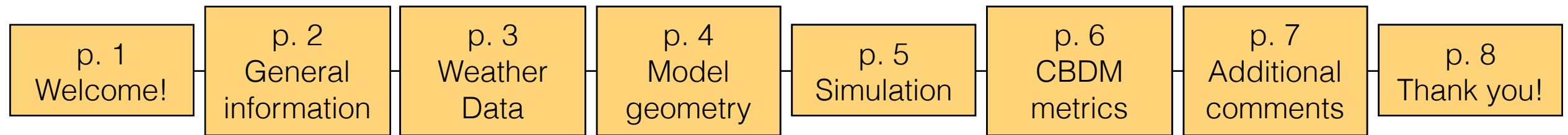
# Unstructured interviews

## 12 Designers working at Arup

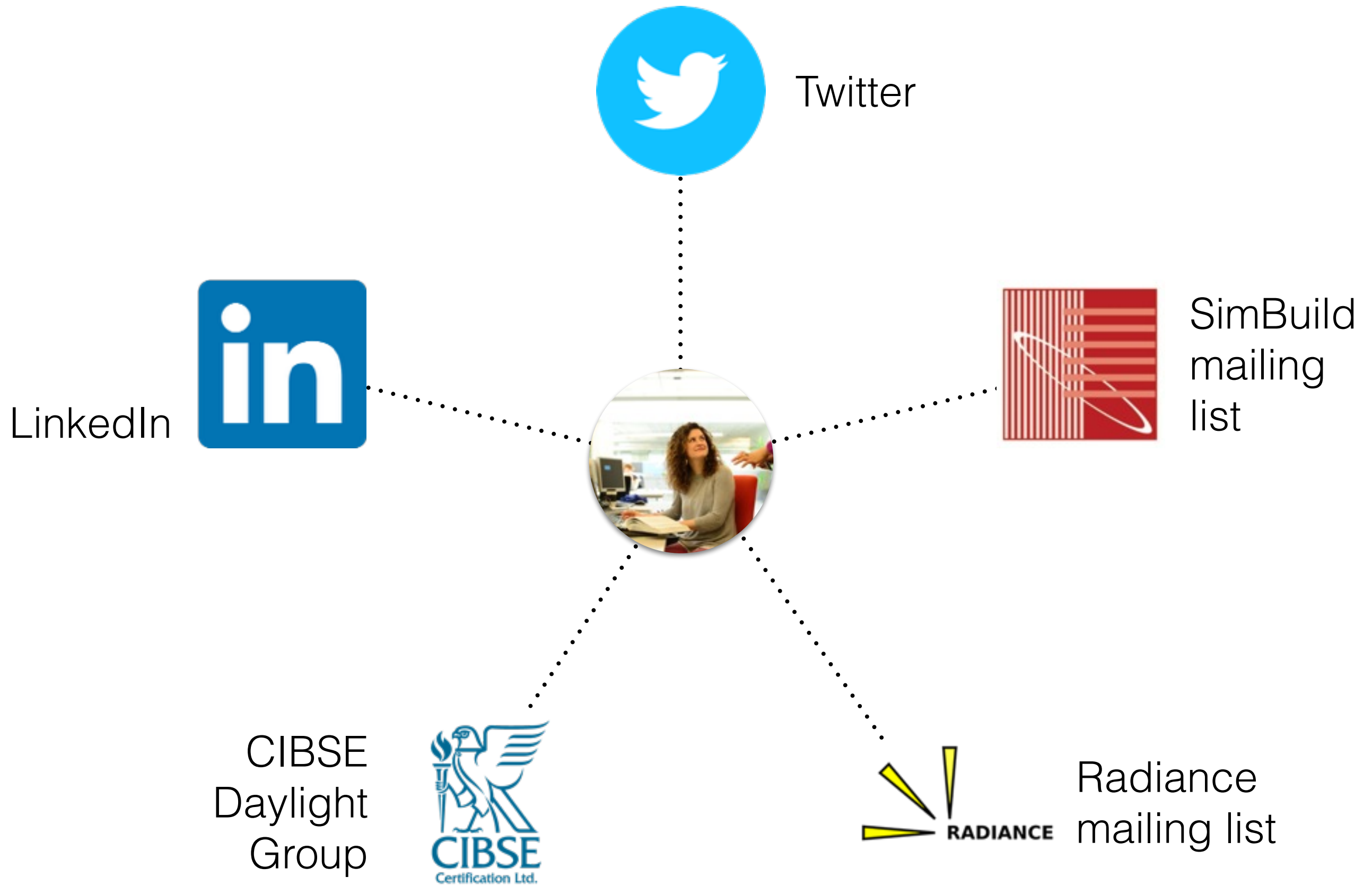




Start: 22/02/2016 | End: 31/06/2016



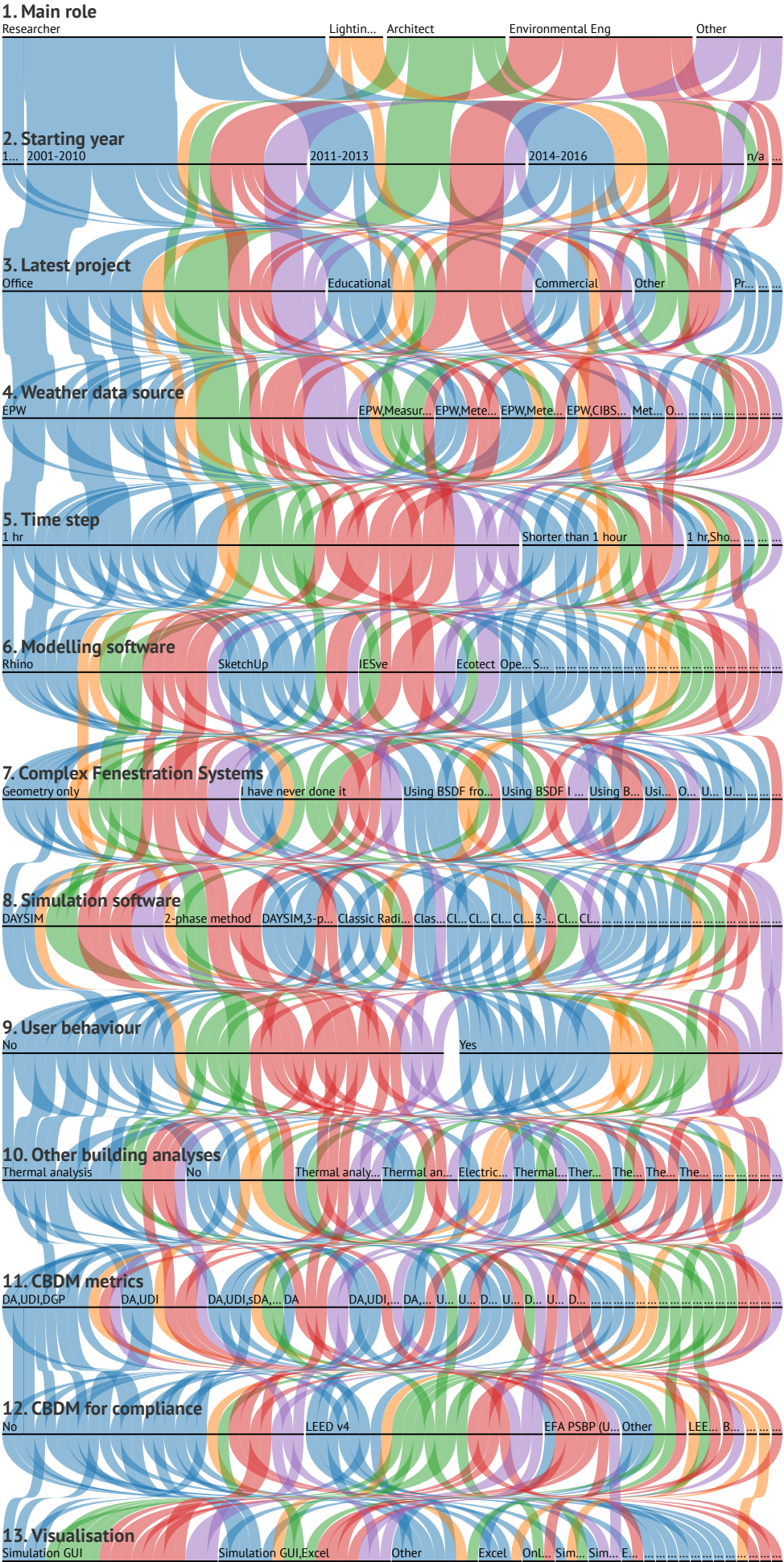
1. What is your main role?
2. When did you start using CBDM for your projects?
3. Which is the latest project where you used CBDM?
4. Where do you source the weather data?
5. What time step do you use?
6. Which modelling software do you use?
7. How do you model complex fenestration systems?
8. Which software/technique do you use to run annual daylight simulations?
9. Do you consider the user behaviour in your model?
10. Do you perform other types of simulations together with daylighting?
11. Which CBDM metrics do you use in your projects?
12. Do you calculate CBDM metrics to comply with a specific standard, guideline or certification? If yes, which one?
13. How do you visualise your annual results?
14. Further comments



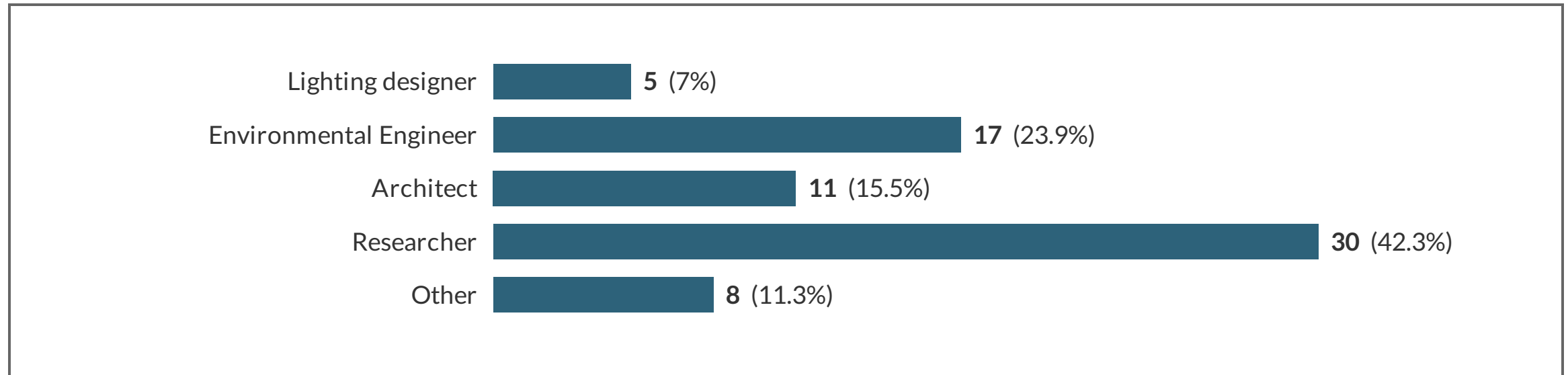
73 responses  
- 1 null  
- 1 invalid  
=  
71 'workflows'



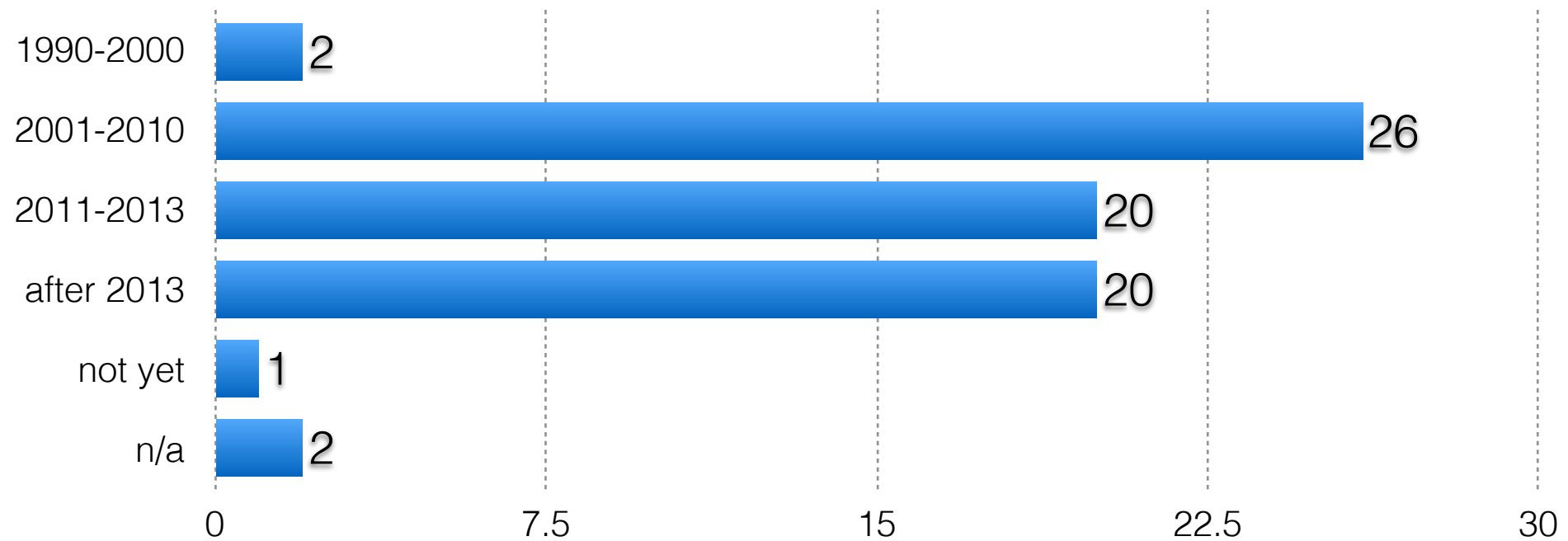
CBDM Workflows



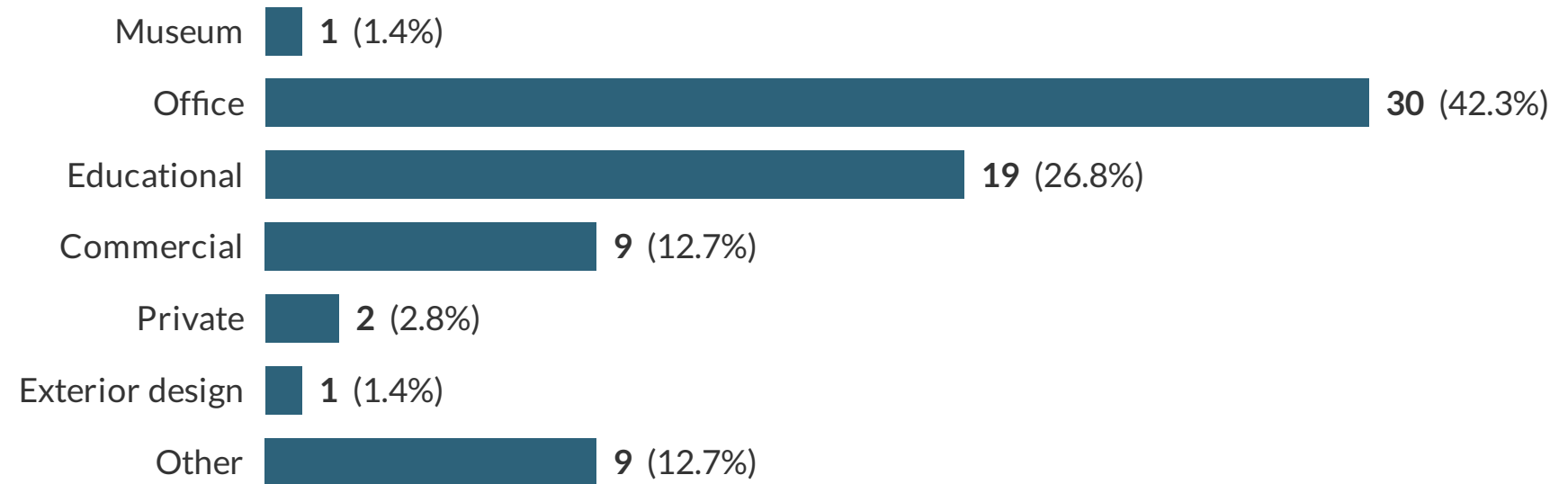
**1** What is your main role?



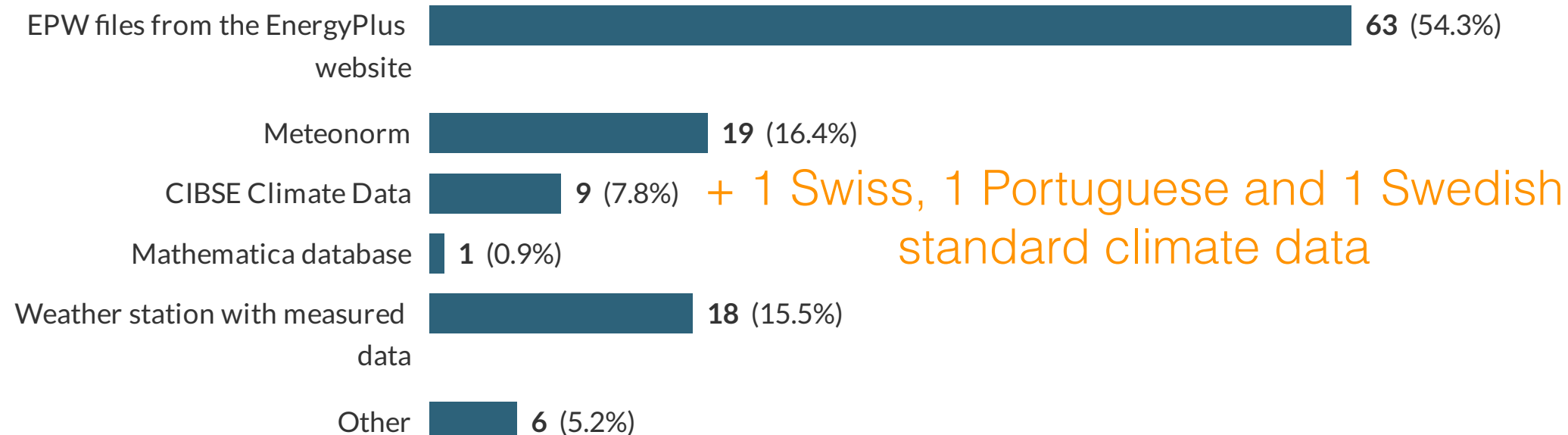
**2** When did you start using CBDM for your projects?



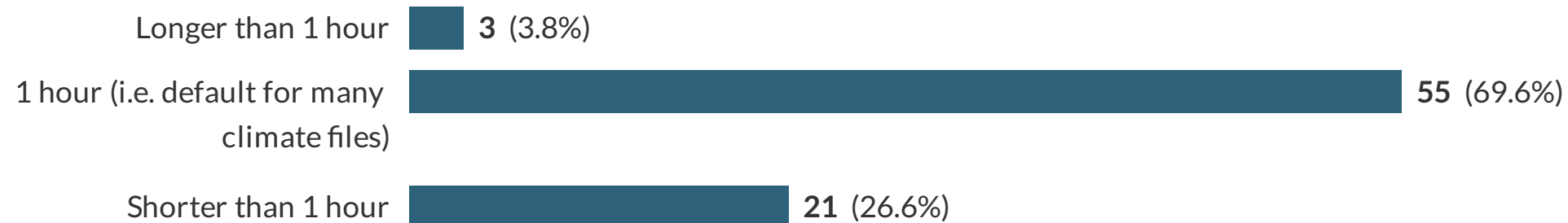
**3** Which is the latest project where you used CBDM?



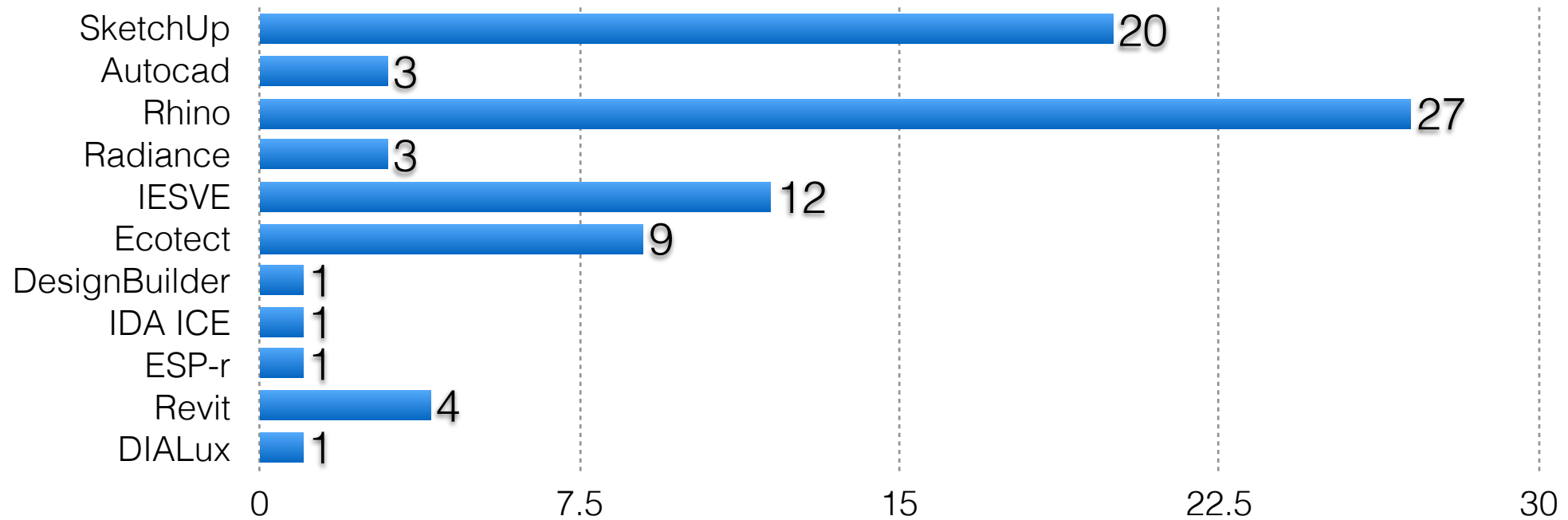
4 Where do you source the weather data for your projects? (Tick all that apply)



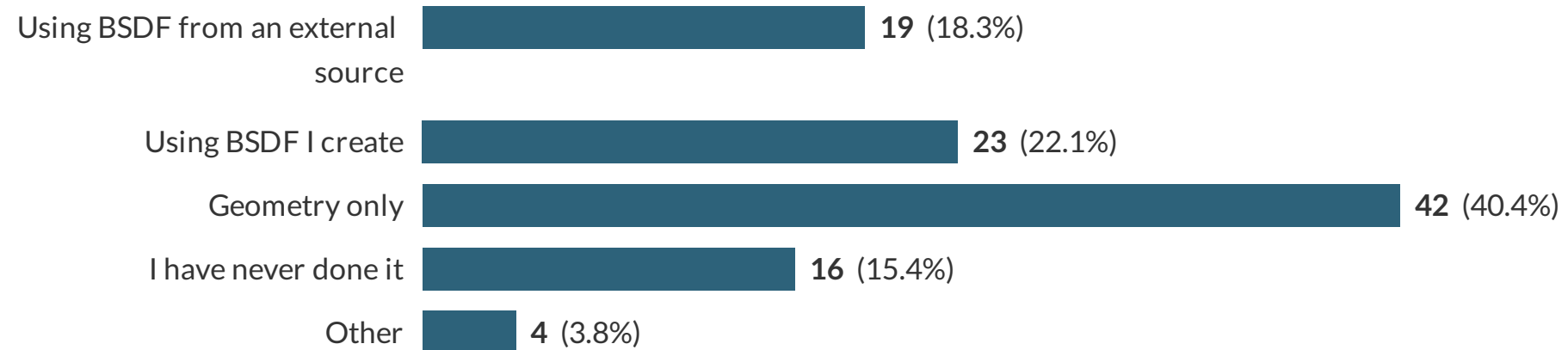
5 What time step do you usually use for the simulation?



6 Which software do you use most often to model or to import the project geometry?



7 How do you model Complex Fenestration Systems (e.g. blinds, light-pipes, prismatic films, ...)? (Tick all that apply)



8 Which program(s)/technique(s) do you use to run annual daylight simulations? (Tick all that apply)

| Which program(s)/technique(s) do you use to run annual daylight simulations? (Tick all that apply) | What is your main role? |                        |           |            |       | No answer | Totals |
|--|-------------------------|------------------------|-----------|------------|-------|-----------|--------|
|  | Lighting designer       | Environmental Engineer | Architect | Researcher | Other |           |        |
| Classic Radiance   | 3                       | 2                      | 4         | 15         | 4     | 0         | 28     |
| DAYSIM   | 3                       | 10                     | 3         | 20         | 4     | 0         | 40     |
| 2-phase method (rcontrib)  | 1                       | 0                      | 0         | 7          | 1     | 0         | 9      |
| 3-phase method   | 1                       | 3                      | 0         | 13         | 1     | 0         | 18     |
| 5-phase method   | 0                       | 0                      | 0         | 4          | 0     | 0         | 4      |
| DIVA-4-Rhino   | 2                       | 3                      | 5         | 11         | 2     | 0         | 23     |
| Autodesk® 3ds Max®   | 0                       | 0                      | 0         | 3          | 0     | 0         | 3      |
| IESve  | 0                       | 7                      | 4         | 1          | 3     | 0         | 15     |
| OpenStudio   | 0                       | 1                      | 0         | 11         | 1     | 0         | 13     |
| Other  | 1                       | 3                      | 2         | 7          | 3     | 0         | 16     |
| No answer  | 0                       | 0                      | 0         | 0          | 0     | 0         | 0      |
| Totals   | 11                      | 29                     | 18        | 92         | 19    | 0         | 169    |

- DAYSIM:
- + 4 Honeybee
  - + 2 Sefaira
  - + 1 Ecotect
  - + 1 SpeedSim-for-DIVA
- 2-phase method:
- + 1 Groundhog
- 3-phase method:
- + 2 SPOT
  - + 1 LightStanza
- + 1 4-component method
- + 2 DIALux
  - + 2 EnergyPlus
  - + 1 TRACE
  - + 1 IDA ICE

8 Which program(s)/technique(s) do you use to run annual daylight simulations? (Tick all that apply)

| Which program(s)/technique(s) do you use to run annual daylight simulations? (Tick all that apply) | What is your main role? |                        |           |            |       | No answer | Totals |
|--|-------------------------|------------------------|-----------|------------|-------|-----------|--------|
|  | Lighting designer       | Environmental Engineer | Architect | Researcher | Other |           |        |
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| OpenStudio   | 0                       | 1                      | 0         | 11         | 1     | 0         | 13     |
| Other  | 1                       | 3                      | 2         | 7          | 3     | 0         | 16     |
| No answer  | 0                       | 0                      | 0         | 0          | 0     | 0         | 0      |
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2-phase method:

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3-phase method:

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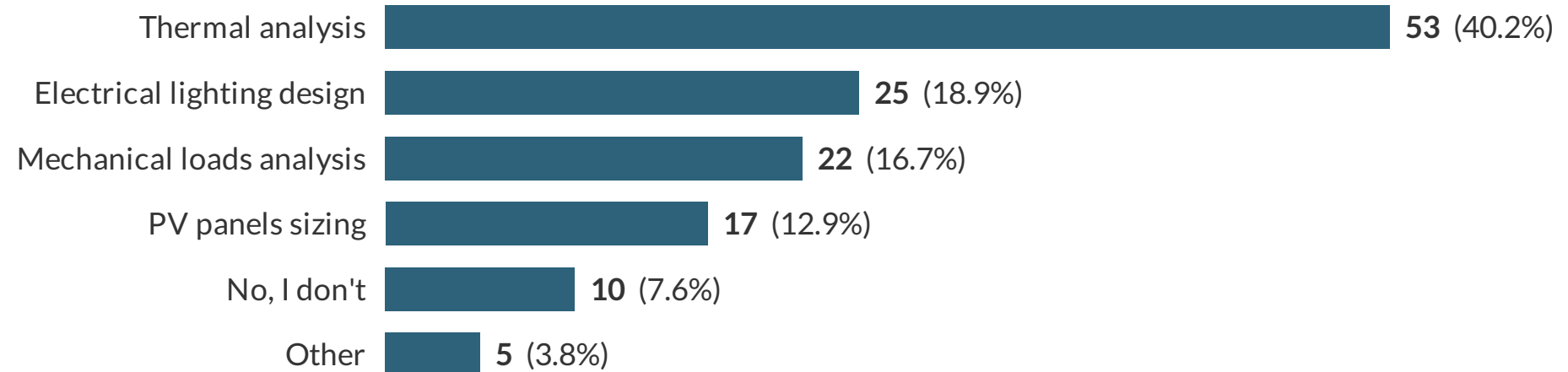
- + 1 4-component method

- + 2 DIALux
- + 2 EnergyPlus
- + 1 TRACE
- + 1 IDA ICE

**9** Do you consider the user behaviour in your model (for blinds and/or electric lights control)?

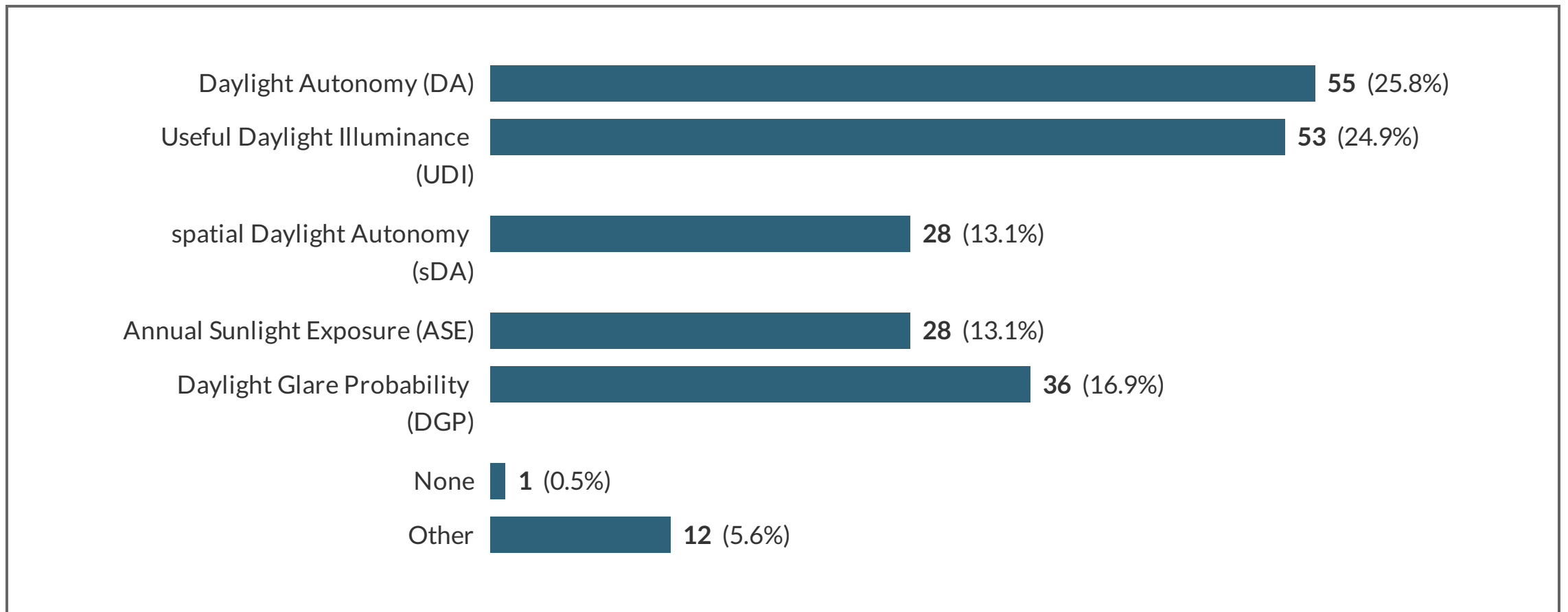


**10** Do you perform other types of simulations together with daylighting? If so, which ones? (Tick all that apply)





**11** Which CBDM metrics do you use in your projects? (Tick all that apply)



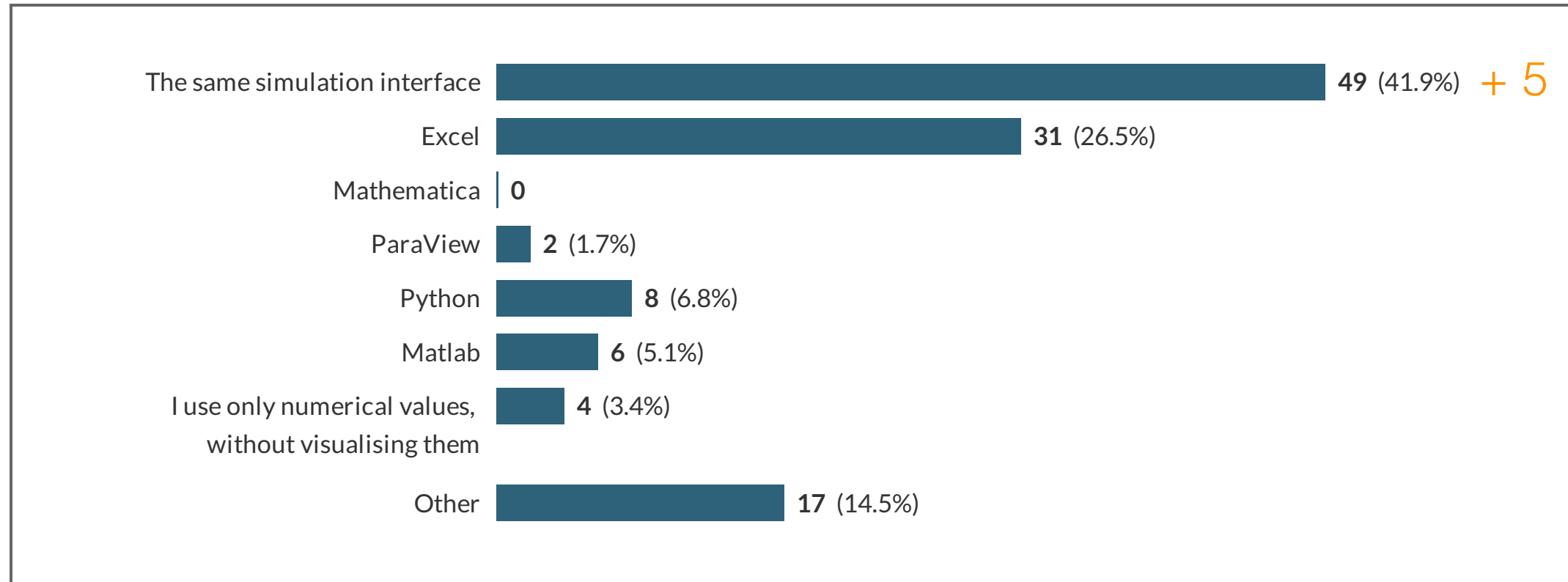
- 12 Do you calculate CBDM metrics to comply with a specific standard, guideline or certification? If yes, which one? (Tick all that apply)

| Do you calculate CBDM metrics to comply with a specific standard, guideline or certification? If yes, which one? (Tick all that apply) | Which is the latest project where you used CBDM? |        |             |            |         |                 |       | No answer | Totals |
|--|--|--------|-------------|------------|---------|-----------------|-------|-----------|--------|
|  | Museum   | Office | Educational | Commercial | Private | Exterior design | Other |           |        |
| LEED v4  | 0  | 17     | 6           | 0          | 1       | 0               | 2     | 0         | 26     |
| BREEAM   | 0  | 2      | 1           | 1          | 0       | 0               | 0     | 0         | 4      |
| EFA PSBP (UK)  | 1  | 1      | 7           | 1          | 0       | 0               | 0     | 0         | 10     |
| No, I don't  | 0  | 10     | 5           | 7          | 1       | 1               | 6     | 0         | 30     |
| Other  | 0  | 6      | 1           | 1          | 0       | 0               | 2     | 0         | 10     |
| No answer  | 0  | 0      | 0           | 0          | 0       | 0               | 0     | 0         | 0      |
| Totals   | 1  | 36     | 20          | 10         | 2       | 1               | 10    | 0         | 80     |

- 12 Do you calculate CBDM metrics to comply with a specific standard, guideline or certification? If yes, which one? (Tick all that apply)

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| BREEAM   | 0  | 2      | 1           | 1          | 0       | 0               | 0     | 0         | 4      |
| EFA PSBP (UK)  | 1  | 1      | 7           | 1          | 0       | 0               | 0     | 0         | 10     |
| No, I don't  | 0  | 10     | 5           | 7          | 1       | 1               | 6     | 0         | 30     |
| Other  | 0  | 6      | 1           | 1          | 0       | 0               | 2     | 0         | 10     |
| No answer  | 0  | 0      | 0           | 0          | 0       | 0               | 0     | 0         | 0      |
| Totals   | 1  | 36     | 20          | 10         | 2       | 1               | 10    | 0         | 80     |

13 Do you visualise your annual results? If so, what tool do you use? (Tick all that apply)



- + 2 R
- + 2 Ecotect (for visualisation only)
- + 1 IDL
- + 1 Gnuplot
- + 1 MathCAD
- + 1 DataGraph
- + 1 Kaleidagraph
- + 1 Surfer
- + 1 Photoshop

Comments!

“Some movement to **standardisation** would be beneficial.”

“CBDM is **not publicised enough** in terms of its benefit to building performance. [...]”

“**More BSDF** inputs would be beneficial to capture technologies within CBDM assessments.”

“CBDM has a great future but **variations in analysis strategy cause confusion** and lack of traction and confidence to industry uptake. [...]”

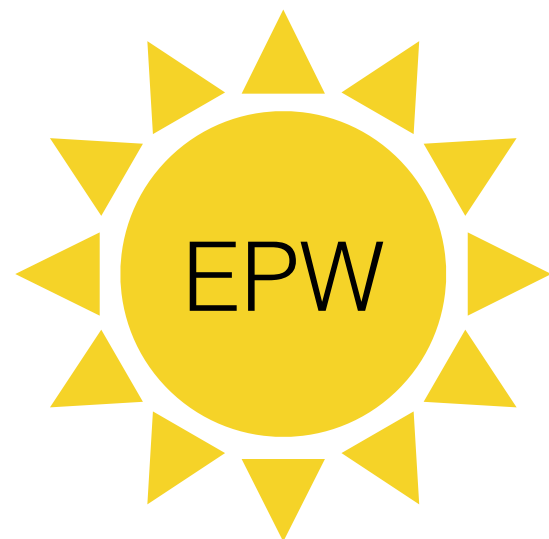
“Some authors of IES LM 83 are coincidentally  
developers of new software for analysis of CBDM metrics.  
**This seems like a conflict of interest.”**

“**Additional guidance** on interpreting metrics is desirable [...] especially in the context of subtly different definition of the same metrics by different authorities. [...]”

“Additional research **linking 'as built' buildings/spaces that can be considered 'well lit' by natural light with their equivalent CBDM metric** results would go a long way in assisting designers in interpreting CBDM results to achieve better designs.”



“I personally think using the term Climate-Based Daylight modeling for annual modeling is misleading. You can [...] run a ‘climate-based analysis’ for a single point in time. The sooner we stop using the wrong term for **annual daylight analysis** the better.”



1 hr



# Thank you!

(And thanks to Francesco Anselmo, Greg Ward and John Mardaljevic for the help)

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